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ABSTRACT

This study examines Finnish college students' views on learning in a virtual university. Respondents studied at Helsinki Virtual Open University (HEVI) and the Apaja Internet Service from 1995-99. HEVI is a Web-based learning environment where students can study, get advice, receive help from tutors, and use office services. Apaja Internet Service provides Web-based courses for university graduates to promote skills relevant to the labor market. Respondents completed a questionnaire evaluating the advantages and disadvantages of Web-based learning. The questionnaire measured basic components of learner-centered and constructivist ideas in learning. Students assessed how learning was tailored to meet their individual needs and how well they received personalized guidance and feedback. They also assessed the disadvantages of Web-based learning by evaluating difficulties due to technology and expenses. Overall, the application of constructivist approaches to Web-based learning had more advantages than disadvantages. However, different students had unique needs, which must be acknowledged more in planning and implementing Web-based courses and learning environments. Age and educational background were important factors influencing students' views on the advantages and disadvantages of Web-based learning. (SM)

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Students' views on learning in virtual university

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Objectives of the study

This paper discusses students' views on learning in virtual university. The students in the study (N=412) represent those who have studied in Helsinki Virtual Open University (HEVI) and Apaja Internet Service during the years 1995-1999. HEVI is a Web-based learning environment, where students can study, get advice, receive help from tutors and use office services. HEVI is a project, which is implemented in co-operation with different departments of the University of Helsinki and its Open University. The HEVI-project is supported by the Ministry of Education and it will continue until the year 2000. Apaja Internet Service provides Web-based courses for university graduates to promote skills relevant to labor market. The purpose of the study is to investigate how students studying in these two services have experienced learning in the Web-based learning environment. The students were asked to evaluate the advantages and disadvantages of Web-based learning by a questionnaire. The questionnaire measured basic components of learner-centered and constructivist ideas in learning (Bonk & Cunningham 1998, 25-50, Jonassen 1995). Students assessed how learning was tailored to meet their individual needs and how well they received personalized guidance and feedback. Furthermore, they assessed the disadvantages of Web-based learning by evaluating the difficulties due to technology and expenses of studies.

Theoretical framework

The theoretical framework for the study is built on constructivism, which is seen as a philosophy of learning based on the idea that knowledge is constructed by learners (Kirschner 1999). Consistent with this philosophy, learning must be situated in a rich context and it needs to be reflective of real world contexts. The main ideas of constructivism and the principles of learner-centered instruction provide the theoretical perspectives on Web-based learning (Bonk & Cunningham 1998, 25-50). The growing number of students who wish to participate in higher education challenges universities to develop distributed learning environments (Dede 1996, 1997). A distributed learning environment is an approach to education and training that is intended to be learner-centered, enabling both synchronous and asynchronous interaction through the integration of pedagogically-appropriate technologies. The approach gives instructors the flexibility to customize learning environments to meet the needs of diverse student populations, while aiming to provide both high quality and cost-effective learning opportunities. Learning environments promote the use of the Internet (WWW) to help students find, evaluate and process information, solve problems, communicate ideas, work collaboratively, and learn how to learn (Kirschner 1999).

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Helsinki Virtual Open University and Apaja Internet Service

The very first web-based courses in Helsinki Virtual Open University (HEVI) (http://www.avoin.helsinki.fi/index.html) were delivered in autumn 1997 (there were some preliminary web-based courses during years 1995 and 1996) and HEVI as a complete service system was opened at January 1998. The courses were built on hypertext, exercises, discussion groups and e-mail conversation. Most of the courses were text based and some had short audiotapes to enrich course environment. The structure of courses varied from an open and free schedule to a more structured and limited schedule for studying and discussions. Most of the courses were only available on the Web, but some courses also had common meetings for teachers and students in the beginning of the course.

The basic philosophy in building the Web-based learning environment of HEVI was to offer to the Open University students' possibility to study in a more flexible way regardless the time and place. Students were supposed to receive more personal guidance and feedback than in traditional teaching. It was assumed that students could have more flexibility and independence in organizing their studies. In Web-based learning environments the elements of collaborative and cooperative learning were put in action and the possibilities for asynchronous interaction were created through different electronic conference systems specially created for HEVI Web-based learning environment. The introductions to HEVI courses are available at http://www.avoin.helsinki.fi/Opiskelu/verkko.asp. During our study there were 13 courses in HEVI.

Apaja Centre (established in 1995) is a national resource centre for university graduates seeking employment and needing guidance for their vocational growth. Apaja Internet Service (http://www.apaja.helsinki.fi) was launched in autumn 1997 and opened officially in January 1998 together with HEVI. Apaja Internet Service provides information, instruction and counseling on careers, and web-based courses to promote skills relevant to the labor market (Kyhäräinen & Pilli-Sihvola 1998). On Apaja's continuing education courses academic job seekers can improve their professional competence or brush up their general working skills. The introductions to Apaja Internet Service courses are available at http://www.apaja.helsinki.fi/opi/kurssikalenteri.asp (only in Finnish), and the interface has changed in summer 2000, but gives anyway the idea of the courses that were available during the study. During our study there were 14 courses in Apaja Internet Service.

Data and methods of the study

The method of the study was a survey that was mailed to all the students who had studied in the virtual University of Helsinki during the years 1995 – 1999. The total number of students who had enrolled to Web-based learning was 875 (HEVI 646, Apaja 229). The questionnaire was sent to the students by mail in September 1999 and 32 questionnaires were returned with unknown address. After two second-

mailings the total number of returned questionnaires were 412 (48,9 % of 843 who got the questionnaire). HEVI's students returned 276 (44,4 %) questionnaires and Apaja's students returned 136 (61,5 %). Most of the respondents (85 %) had studied on Web-based course during academic year 1998 – 1999 or during academic year 1997 – 1998 (14 %). Only four respondents had studied at the preliminary courses during 1995 – 1996.

The majority (73 %) of the respondents were female. Nearly half of them (47 %) had a university degree. The students of Apaja differed from the students of HEVI with their higher educational backgrounds. The majority of students (70 %) were born in the 1950s or 1960s. The youngest student was 17 years and the oldest student was 65 years. They both studied in HEVI. In general, the students of HEVI had a wider age distribution than the academic students of Apaja. There were no differences between males and females in age distribution. The majority of students (83 %) lived in the capital area or southern parts of Finland. Only thirteen students (3 %) lived abroad. The students of HEVI and Apaja didn't differ from each other in their home districts.

Half of students (58 %) studied with their own computer at home and 24 % of students used computers at their work. Only 10 % of students were able to use computers both at home and at work. The minority of students (6 %) studied at institutes, libraries (1 %), friends' homes and other places (2 %). Half of the students (55 %) had modem connections, 22 % of them had fixed connections and 14 % of students reported using ISDN connections. Some students (9 %) were not able to tell the type of connection they used. Nearly 79 % of respondents used Explorer 4.0 or Netscape 4.0 or more recent browser. Explorer 4.0 was the most favored explorer version (50 %) by the students of the virtual university.

Results

The questionnaire used a 5-point Likert-scale. The students were asked to assess the advantages and disadvantages of learning in virtual university. The answers were analyzed with standard statistic indicators (means and standard deviations). The more abstract dimensions behind students' ratings were analyzed with the help of factor analysis. The influence of demographic data was analyzed with ANOVA.

Students' views on the advantages of Web-based learning were categorized with the help of factor analysis. The chosen factor solution was based on the "variance greater than 1.0" rule (Kaiser1970, 401-415) and the "scree" of Cattell (Cattell 1978, 76-91). The variables describing advantages in learning were factor analyzed (PAF) with varimax rotation. The number of factors was first defined with Kaiser criteria (1,0), which produced the solution of nine factors. Careful examination of the factors and the "scree" of Cattell showed us that six or seven factors were more justified for our sample. Thus, the variables with communality value under .30 were discarded and the solution of seven factors was selected for our further analysis. The seven-factor solution with the highest loading in each factor is presented in Table 1. The selected factor solution explained 53.6 % of the total variance.

Table 1. Factor solution for the advantages of learning in virtual university

Factor	Description of the first two to four items on the factor	Loading
F1 Utility and transfer in learning (16 items)	The things I have learned have been of practical value for me	.84
	I have been able to use the things I have learned during Web-course in other contexts	.82
	The things I have learned in Web-course have been useful	.78
	Learning has helped me to solve problems better	.76
F2 Conversational and collaborative learning (12 items)	The discussions in web with other students have helped me to learn	.80
	The students were committed to co-operate with each other in the Web-course	.78
	I had a chance to give feedback to the other students about their learning	.75
	I had strong ties with the other students in the same group	.75
F3 Intentional and self-directed learning (9 items)	I planned my own schedule	.74
	I self-directed my own studies	.73
	I proceeded with my own pace in my studies	.68
	I proceeded according to my own goals from one excercise to another in the Web-course	.63
F4 Individual feedback from the teacher (4 items)	I received feedback from the teacher about my progress in the Web -course	.83
	I received individual feedback about my learning from the teacher	.75
	The teacher supported my activity in the Web-course	.66
F5 Support for individual learning processes (2 items)	The individual differences were acknowledged in the beginning of the course	.89
	The Web-course acknowledged individual differences in students	.68
F6 Constructivism in learning (3 items)	I was able to use my previous knowledge about the topic	.70
	The new things in the course material were connected to my previous studies	.67
	I was able to use my own practical experience in my studies on the Web-course	.50
F7 Possibilities provided by Web learning environment (3 items)	The real life situations created with multimedia helped me to learn	.41
	The links in the Web-course helped me to learn	.36
	The web learning environment had activities that helped me to plan my personal study plan	.35

The factors represented the following advantages of learning in virtual university: "Utility and transfer in learning," "Conversational and collaborative learning," "Intentional and self-directed learning," "Individual feedback from the teacher," "Support for individual learning processes," "Constructivism in learning," and "Possibilities provided by Web learning environment". Composite variables were created based on factor analysis and reliability analysis. Reliability was measured by Cronbach's Alpha, which varied from .93 to .67 showing that all composite variables were reliable to be used for further analysis.

The means in each factor representing the advantages of learning show that the students had been quite happy with their virtual studies. The students have enjoyed the constructivist components of Web-based learning and the possibilities to self-

direct their own studies. Factor 3 "Intentional and self-directed learning" and factor 6 "Constructivism in learning" had both rankings higher than 3 in the scale 1-5. ANOVA statistics was used to explore the possible differences of males and females concerning the advantages of learning in the virtual university. No statistical significant differences were found in any of the seven factors representing advantageous learning. However, some differences were found between the students of HEVI and Apaja (see Table 2). The academic students of Apaja rated the possibilities for conversational and collaborative learning higher than the students of HEVI. This difference can partly be explained by the different educational level of the students in these two environments. Furthermore, the Web-courses in Apaja may involve more conversational and collaborative components than the courses provided by HEVI. The students of these two services differed from each other in their ratings of intentional and self-directed learning. The students of Hevi had found the environment more advantageous for self-directed learning than the students of Apaja. Students of Apaja reported more support from their teacher than the students of HEVI. Furthermore, the students of Apaja reported more support for their individual learning processes then the students of HEVI (see Table 2) .

Table 2. Group HEVI / Apaja: Means, standard deviations (in parentheses) and F-values with significance on advantages of learning factors.

Factor	HEVI N = 218	Apaja N = 110	F-value and significance
Utility and transfer in learning	2.9 (0.78)	2.9 (0.93)	2.2 n.s.
Conversational and collaborative learning	1,9 (0,81)	2,6 (1,02)	22,3 ***
Intentional and self-directed learning	3,9 (0,72)	3,6 (0,84)	5,9 **
Individual feedback from the teacher	2,7 (1,09)	3,2 (1,09)	9,0 ***
Support for individual learning processes	2,3 (1,06)	2,9 (1,22)	10,3 ***
Constructivism in learning	3,3 (0,98)	3,4 (1,07)	1,8 n.s.
Possibilities provided by Web learning environment	2,5 (0,80)	2,4 (0,90)	1,9 n.s.

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

The different educational background of students explained some differences in their ratings. Students whose background was in higher education were more able to take advantage of conversational and collaborative learning in Web-courses than the students with secondary, polytechnics or vocational backgrounds. Furthermore, they were more satisfied with the individual feedback from their teacher and support for individual learning processes than the students without educational background in higher education (see Table 3).

Table 3. Group Education: Mean Scores, standard deviations (in parentheses) and F-values with significance on advantages of learning factors.

Factor	Basic and upper secondary N = 65	Polytechnics and vocational N = 93	Higher education N = 168	F-value and significance
Utility and transfer in learning	2,8 (0,76)	2,9 (0,82)	2,9 (0,87)	0,3 n.s.
Conversational and collaborative learning	1,9 (0,82)	2,0 (0,94)	2,3 (0,99)	4,9 **
Intentional and self-directed learning	4,0 (0,70)	3,8 (0,74)	3,7 (0,82)	2,0 n.s.
Individual feedback from the teacher	2,7 (0,95)	2,6 (1,17)	3,1 (1,09)	6,7 ***
Support for individual learning processes	2,5 (1,14)	2,2 (0,97)	2,7 (1,19)	4,2 *
Constructivism in learning	3,3 (1,01)	3,4 (0,98)	3,4 (1,02)	0,1 n.s.
Possibilities provided by Web learning environment	2,6 (0,81)	2,5 (0,76)	2,5 (0,90)	0,5 n.s.

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

The age of the students explained their views on the advantages of learning in Web-based environment. Those students who were 35 years or younger were more able to take advantage of the individualized learning than their older fellow students (see Table 4.)

Table 4. Group Age: Mean Scores, standard deviations (in parentheses) and F-values with significance on advantages of learning factors.

Factor	Age 35 and under N = 165	Age 36 and above N = 155	F-value and significance
Utility and transfer in learning	2,9 (0,89)	2,9 (0,78)	0,3 n.s.
Conversational and collaborative learning	2,1 (0,96)	2,2 (0,95)	0,4 n.s.
Intentional and self-directed learning	3,8 (0,80)	3,8 (0,76)	0,0 n.s.
Individual feedback from the teacher	2,9 (1,07)	2,8 (1,17)	0,1 n.s.
Support for individual learning processes	2,7 (1,11)	2,3 (1,13)	6,9 **
Constructivism in learning	3,5 (0,94)	3,3 (1,05	1,1 n.s.
Possibilities provided by Web learning environment	2,5 (0,84)	2,5 (0,82)	0,0 n.s.

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

Students' views on the disadvantages of Web-based learning were represented by nine factors. The nine-factor solution explained 54,3 % of the total variance. The negative aspects of virtual learning dealt with the following matters: "Lack of interaction with other students," "Technical difficulties," "Lack of time," "Expensive cost of studies," "Difficulties with the Web-pages," "Difficulties with communication," "Lack of personal guidance, " "Difficulties with the whole environment," and "Studies were too demanding". The highest loading variables for each factor are presented in Table 5. Composite variables were created based on factor analysis and reliability analysis. Reliability was measured by Cronbach's Alpha, which varied from .91 to .71 showing that all composite variables were reliable to be used for further analysis.

Table 5. Factor solution for the disadvantages of learning in virtual university

Factor	Description of the first three items on the factor	Loading
F1 Lack of interaction with other students (10 items)	I did not like the idea of not knowing my fellow students I felt too distant from my fellow students It was difficult not to see the facial expressions of others	.86 .85 .80
F2 Technical difficulties (8 items)	The pages of Web course did not load at all I had difficulties to access the course pages The connection to the Web-course was often suddenly lost	.79 .72 .71
F3 Lack of time (4 items)	I had problems to find time to study I could not keep my study-plan I had problems in fitting my studies to my life situation	.78 .77 .69
F4 Expensive cost of studies (4 items)	The Web-connection were too expensive. Due to the expenses the time spent in Web was too short. The equipment and materials needed were too expensive	.85 .71 .71
F5 Difficulties with the Web-pages (3 items)	I was not able to save the page I needed I was not able to print materials from the Web-pages I had problems in finding the page I needed	.70 .53 .49
F6 Difficulties with communication (4 items)	I found it difficult to express myself to unknown people I had problems to express myself by writing I found it difficult to participate to the mutual discussion in Web	.76 .64 .46
F7 Lack of personal guidance (3 items)	I did not receive personal feedback about my learning I did not receive enough guidance for planning my studies It was difficult to contact the teacher	.60 .59 .46
F8 Difficulties with the whole environment (3 items)	I could not follow the links in the Web-course The Web environment was difficult to know I could not take advantage of the links in the Web-course	.68 .63 .44
F9 Studies were too demanding (3 items)	The contents of the studies were too demanding I was disturbed by the huge amount of knowledge in Web-course I felt I had too much responsibility for my studies	.72 .64 .48

The means in each factor representing the disadvantages of learning show that the students had not experienced many negative learning experiences with their virtual studies. Most of the means in each factor are lower than 3 in the scale 1-5. ANOVA statistics was used to explore the possible differences of males and females concerning the disadvantages of learning in the virtual university. No statistical significant differences were found in any of the nine factors representing possible difficulties in Web-based learning. However, some differences were found between the students of HEVI and Apaja (see Table 6). The students of HEVI found the expensive cost of studies to be a bigger disadvantage in Web-based learning than the students of Apaja. Furthermore, they complained about the lack of personal guidance and studies that were too demanding for them in greater amount than the students of Apaja (see Table 6).

Table 6. Group HEVI / Apaja: Means, standard deviations (in parentheses) and F-values with significance on disadvantages of learning factors.

Factor	HEVI N= 218	Apaja N = 110	F-value and significance
F1	1,9 (0,84)	1,9 (0,93)	0,0 n.s.
F2	1,6 (0,74)	1,6 (0,66)	0,3 n.s.
F3	2,6 (1,18)	2,3 (1,14)	2,7 n.s.
F4 Expensive cost of studies	2,1 (1,04)	1,4 (0,74)	18,3 ***
F5	1,6 (0,82)	1,5 (0,79)	0,7 n.s.
F6	1,8 (0,77)	1,7 (0,76)	0,5 n.s.
F7 Lack of personal guidance	2,3 (1,03)	2,0 (1,00)	3,0 *
F8	1,8 (0,88)	1,6 (0,87)	1,8 n.s.
F9 Studies were too demanding	1,8 (0,93)	1,5 (0,75)	5,1 ***

Scale= 1 = does not describe ... 5 = describes well
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The educational background of students explained some of the negative experiences they had experienced in the Web-based learning environment. The students with polytechnics and vocational education complained more lack of time than the students with higher education or secondary backgrounds (see Table 7). On the other hand, the students with secondary education had more problems with the expensive cost of Web-courses than the students with other kinds of educational background had. The students with polytechnics and vocational education had more difficulties with communication in Web than the other students had. Furthermore, they felt the studies more demanding than the other groups of students (see Table 7).

Table 7. Group: Education. Mean Scores, standard deviations (in parentheses) and F-values with significance on disadvantages of learning factors.

Factor	Basic and upper secondary	Polytechnics and vocational	Higher education	F-value and significance
F1	1,9 (0,77)	1,9 (0,77)	1,8 (0,96)	0,3 n.s.
F2	1,6 (0,74)	1,7 (0,79)	1,5 (0,67)	0,9 n.s.
F3 Lack of time	2,3 (1,14)	2,8 (1,14)	2,4 (1,18)	3,9 *
F4 Cost	2,2 (1,11)	2,0 (0,99)	1,6 (0,92)	9,2 ***
F5	1,6 (0,84)	1,6 (0,89)	1,5 (0,75)	0,7 n.s.
F6 Communi-cation	1,7 (0,72)	1,9 (0,82)	1,7 (0,78)	4,7 **
F7	2,2 (0,97)	2,4 (1,12)	2,0 (0,99)	1,3 n.s.
F8	1,7 (0,66)	1,8 (0,94)	1,7 (0,91)	1,3 n.s.
F9 Demanding	1,7 (0,81)	2,0 (0,99)	1,5 (0,79)	7,4 ***

Scale= 1 = does not describe ... 5 = describes well
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The age was a natural explanation for many disadvantages experienced by students. The older students had experienced more difficulties with communication than the younger students. Furthermore, they had had more difficulties with the whole environment in general (see Table 8).

Table 8. Group: Age. Mean Scores, standard deviations (in parentheses) and F-values with significance on disadvantages of learning factors.

Factor	Age 35 and under	Age 36 and above	F-value and significance
F1	1,8 (0,85)	1,9 (0,90)	0,2 n.s.
F2	1,6 (0,72)	1,6 (0,73)	0,1 n.s.
F3	2,5 (1,15)	2,5 (1,22)	0,0 n.s.
F4	1,8 (0,93)	1,9 (1,08)	0,0 n.s.
F5	1,5 (0,73)	1,6 (0,89)	2,7 n.s.
F6 Commu-nication	1,6 (0,65)	1,8 (0,89)	5,8 *
F7	2,1 (0,92)	2,3 (1,15)	2,9 n.s.
F8 The whole environ ment	1,6 (0,69)	1,8 (1,00)	4,8 *
F9	1,6 (0,83)	1,8 (0,92)	1,4 n.s.

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Concluding remarks

The findings of the study indicate that application of constructivist approaches to Web-based learning has more advantages than disadvantages as evaluated by students of the virtual university. However, different learners have unique needs that should be acknowledged more in planning and implementing Web-courses and Web-based learning environment. As our study shows, the age and the educational background of the student are important factors that influence his/her learning. Furthermore, the findings have significant educational implications. Students' views on learning in

virtual university can be used in the process of building more learner-centered approaches to Web-based teaching. The results of this study give information about the preferences in learning by different learners. The empirical results show some of these preferences that can be acknowledged in developing the virtual university for the future.

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Objectives of the study

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Theoretical framework

The theoretical framework for the study is built on constructivism, which is seen as a philosophy of learning based on the idea that knowledge is constructed by learners (Kirschner 1999). Consistent with this philosophy, learning must be situated in a rich context and it needs to be reflective of real world contexts. The main ideas of constructivism and the principles of learner-centered instruction provide the theoretical perspectives on Web-based learning (Bonk & Cunningham 1998, 25-50). The growing number of students who wish to participate in higher education challenges universities to develop distributed learning environments (Dede 1996, 1997). A distributed learning environment is an approach to education and training that is intended to be learner-centered, enabling both synchronous and asynchronous interaction through the integration of pedagogically-appropriate technologies. The approach gives instructors the flexibility to customize learning environments to meet the needs of diverse student populations, while aiming to provide both high quality and cost-effective learning opportunities. Learning environments promote the use of the Internet (WWW) to help students find, evaluate and process information, solve problems, communicate ideas, work collaboratively, and learn how to learn (Kirschner 1999).

Helsinki Virtual Open University and Apaja Internet Service

The very first web-based courses in Helsinki Virtual Open University (HEVI) (http://www.avoin.helsinki.fi/index.html) were delivered in autumn 1997 (there were some preliminary web-based courses during years 1995 and 1996) and HEVI as a complete service system was opened at January 1998. The courses were built on hypertext, exercises, discussion groups and e-mail conversation. Most of the courses were text based and some had short audiotapes to enrich course environment. The structure of courses varied from an open and free schedule to a more structured and limited schedule for studying and discussions. Most of the courses were only available on the Web, but some courses also had common meetings for teachers and students in the beginning of the course.

The basic philosophy in building the Web-based learning environment of HEVI was to offer to the Open University students' possibility to study in a more flexible way regardless the time and place. Students were supposed to receive more personal guidance and feedback than in traditional teaching. It was assumed that students could have more flexibility and independence in organizing their studies. In Web-based learning environments the elements of collaborative and cooperative learning were put in action and the possibilities for asynchronous interaction were created through different electronic conference systems specially created for HEVI Web-based learning environment. The introductions to HEVI courses are available at http://www.avoin.helsinki.fi/Opiskelu/verkko.asp. During our study there were 13 courses in HEVI.

Apaja Centre (established in 1995) is a national resource centre for university graduates seeking employment and needing guidance for their vocational growth. Apaja Internet Service (http://www.apaja.helsinki.fi) was launched in autumn 1997 and opened officially in January 1998 together with HEVI. Apaja Internet Service provides information, instruction and counseling on careers, and web-based courses to promote skills relevant to the labor market (Kyhäräinen & Pilli-Sihvola 1998). On Apaja's continuing education courses academic job seekers can improve their professional competence or brush up their general working skills. The introductions to Apaja Internet Service courses are available at http://www.apaja.helsinki.fi/opi/kurssikalenteri.asp (only in Finnish), and the interface has changed in summer 2000, but gives anyway the idea of the courses that were available during the study. During our study there were 14 courses in Apaja Internet Service.

Data and methods of the study

The method of the study was a survey that was mailed to all the students who had studied in the virtual University of Helsinki during the years 1995 – 1999. The total number of students who had enrolled to Web-based learning was 875 (HEVI 646, Apaja 229). The questionnaire was sent to the students by mail in September 1999 and 32 questionnaires were returned with unknown address. After two second-

mailings the total number of returned questionnaires were 412 (48,9 % of 843 who got the questionnaire). HEVI's students returned 276 (44,4 %) questionnaires and Apaja's students returned 136 (61,5 %). Most of the respondents (85 %) had studied on Web-based course during academic year 1998 – 1999 or during academic year 1997 – 1998 (14 %). Only four respondents had studied at the preliminary courses during 1995 – 1996.

The majority (73 %) of the respondents were female. Nearly half of them (47 %) had a university degree. The students of Apaja differed from the students of HEVI with their higher educational backgrounds. The majority of students (70 %) were born in the 1950s or 1960s. The youngest student was 17 years and the oldest student was 65 years. They both studied in HEVI. In general, the students of HEVI had a wider age distribution than the academic students of Apaja. There were no differences between males and females in age distribution. The majority of students (83 %) lived in the capital area or southern parts of Finland. Only thirteen students (3 %) lived abroad. The students of HEVI and Apaja didn't differ from each other in their home districts.

Half of students (58 %) studied with their own computer at home and 24 % of students used computers at their work. Only 10 % of students were able to use computers both at home and at work. The minority of students (6 %) studied at institutes, libraries (1 %), friends' homes and other places (2 %). Half of the students (55 %) had modem connections, 22 % of them had fixed connections and 14 % of students reported using ISDN connections. Some students (9 %) were not able to tell the type of connection they used. Nearly 79 % of respondents used Explorer 4.0 or Netscape 4.0 or more recent browser. Explorer 4.0 was the most favored explorer version (50 %) by the students of the virtual university.

Results

The questionnaire used a 5-point Likert-scale. The students were asked to assess the advantages and disadvantages of learning in virtual university. The answers were analyzed with standard statistic indicators (means and standard deviations). The more abstract dimensions behind students' ratings were analyzed with the help of factor analysis. The influence of demographic data was analyzed with ANOVA.

Students' views on the advantages of Web-based learning were categorized with the help of factor analysis. The chosen factor solution was based on the "variance greater than 1.0" rule (Kaiser1970, 401-415) and the "scree" of Cattell (Cattell 1978, 76-91). The variables describing advantages in learning were factor analyzed (PAF) with varimax rotation. The number of factors was first defined with Kaiser criteria (1,0), which produced the solution of nine factors. Careful examination of the factors and the "scree" of Cattell showed us that six or seven factors were more justified for our sample. Thus, the variables with communality value under .30 were discarded and the solution of seven factors was selected for our further analysis. The seven-factor solution with the highest loading in each factor is presented in Table 1. The selected factor solution explained 53.6 % of the total variance.

Table 1. Factor solution for the advantages of learning in virtual university

Factor	Description of the first two to four items on the factor	Loading
F1 Utility and transfer in learning (16 items)	The things I have learned have been of practical value for me	.84
	I have been able to use the things I have learned during Web-course in other contexts	.82
	The things I have learned in Web-course have been useful	.78
	Learning has helped me to solve problems better	.76
F2 Conversational and collaborative learning (12 items)	The discussions in web with other students have helped me to learn	.80
	The students were committed to co-operate with each other in the Web-course	.78
	I had a chance to give feedback to the other students about their learning	.75
	I had strong ties with the other students in the same group	.75
F3 Intentional and self-directed learning (9 items)	I planned my own schedule	.74
	I self-directed my own studies	.73
	I proceeded with my own pace in my studies	.68
	I proceeded according to my own goals from one excercise to another in the Web-course	.63
F4 Individual feedback from the teacher (4 items)	I received feedback from the teacher about my progress in the Web -course	.83
	I received individual feedback about my learning from the teacher	.75
	The teacher supported my activity in the Web-course	.66
F5 Support for individual learning processes (2 items)	The individual differences were acknowledged in the beginning of the course	.89
	The Web-course acknowledged individual differences in students	.68
F6 Constructivism in learning (3 items)	I was able to use my previous knowledge about the topic	.70
	The new things in the course material were connected to my previous studies	.67
	I was able to use my own practical experience in my studies on the Web-course	.50
F7 Possibilities provided by Web learning environment (3 items)	The real life situations created with multimedia helped me to learn	.41
	The links in the Web-course helped me to learn	.36
	The web learning environment had activities that helped me to plan my personal study plan	.35

The factors represented the following advantages of learning in virtual university: "Utility and transfer in learning," "Conversational and collaborative learning," "Intentional and self-directed learning," "Individual feedback from the teacher," "Support for individual learning processes," "Constructivism in learning," and "Possibilities provided by Web learning environment". Composite variables were created based on factor analysis and reliability analysis. Reliability was measured by Cronbach's Alpha, which varied from .93 to .67 showing that all composite variables were reliable to be used for further analysis.

The means in each factor representing the advantages of learning show that the students had been quite happy with their virtual studies. The students have enjoyed the constructivist components of Web-based learning and the possibilities to self-

direct their own studies. Factor 3 "Intentional and self-directed learning" and factor 6 "Constructivism in learning" had both rankings higher than 3 in the scale 1-5. ANOVA statistics was used to explore the possible differences of males and females concerning the advantages of learning in the virtual university. No statistical significant differences were found in any of the seven factors representing advantageous learning. However, some differences were found between the students of HEVI and Apaja (see Table 2). The academic students of Apaja rated the possibilities for conversational and collaborative learning higher than the students of HEVI. This difference can partly be explained by the different educational level of the students in these two environments. Furthermore, the Web-courses in Apaja may involve more conversational and collaborative components than the courses provided by HEVI. The students of these two services differed from each other in their ratings of intentional and self-directed learning. The students of Hevi had found the environment more advantageous for self-directed learning than the students of Apaja. Students of Apaja reported more support from their teacher than the students of HEVI. Furthermore, the students of Apaja reported more support for their individual learning processes then the students of HEVI (see Table 2) .

Table 2. Group HEVI / Apaja: Means, standard deviations (in parentheses) and F-values with significance on advantages of learning factors.

Factor	HEVI N = 218	Apaja N = 110	F-value and significance
Utility and transfer in learning	2.9 (0.78)	2.9 (0.93)	2.2 n.s.
Conversational and collaborative learning	1,9 (0,81)	2,6 (1,02)	22,3 ***
Intentional and self-directed learning	3,9 (0,72)	3,6 (0,84)	5,9 **
Individual feedback from the teacher	2,7 (1,09)	3,2 (1,09)	9,0 ***
Support for individual learning processes	2,3 (1,06)	2,9 (1,22)	10,3 ***
Constructivism in learning	3,3 (0,98)	3,4 (1,07)	1,8 n.s.
Possibilities provided by Web learning environment	2,5 (0,80)	2,4 (0,90)	1,9 n.s.

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

The different educational background of students explained some differences in their ratings. Students whose background was in higher education were more able to take advantage of conversational and collaborative learning in Web-courses than the students with secondary, polytechnics or vocational backgrounds. Furthermore, they were more satisfied with the individual feedback from their teacher and support for individual learning processes than the students without educational background in higher education (see Table 3).

Table 3. Group Education: Mean Scores, standard deviations (in parentheses) and F-values with significance on advantages of learning factors.

Factor	Basic and upper secondary N = 65	Polytechnics and vocational N = 93	Higher education N = 168	F-value and significance
Utility and transfer in learning	2,8 (0,76)	2,9 (0,82)	2,9 (0,87)	0,3 n.s.
Conversational and collaborative learning	1,9 (0,82)	2,0 (0,94)	2,3 (0,99)	4,9 **
Intentional and self-directed learning	4,0 (0,70)	3,8 (0,74)	3,7 (0,82)	2,0 n.s.
Individual feedback from the teacher	2,7 (0,95)	2,6 (1,17)	3,1 (1,09)	6,7 ***
Support for individual learning processes	2,5 (1,14)	2,2 (0,97)	2,7 (1,19)	4,2 *
Constructivism in learning	3,3 (1,01)	3,4 (0,98)	3,4 (1,02)	0,1 n.s.
Possibilities provided by Web learning environment	2,6 (0,81)	2,5 (0,76)	2,5 (0,90)	0,5 n.s.

Scale= 1 = does not describe ... 5 = describes well
Significance: $p < .05$ = *, $p < .01$ =**, $p < .001$ = ***

The age of the students explained their views on the advantages of learning in Web-based environment. Those students who were 35 years or younger were more able to take advantage of the individualized learning than their older fellow students (see Table 4.)

Table 4. Group Age: Mean Scores, standard deviations (in parentheses) and F-values with significance on advantages of learning factors.

Factor	Age 35 and under N = 165	Age 36 and above N = 155	F-value and significance
Utility and transfer in learning	2,9 (0,89)	2,9 (0,78)	0,3 n.s.
Conversational and collaborative learning	2,1 (0,96)	2,2 (0,95)	0,4 n.s.
Intentional and self-directed learning	3,8 (0,80)	3,8 (0,76)	0,0 n.s.
Individual feedback from the teacher	2,9 (1,07)	2,8 (1,17)	0,1 n.s.
Support for individual learning processes	2,7 (1,11)	2,3 (1,13)	6,9 **
Constructivism in learning	3,5 (0,94)	3,3 (1,05	1,1 n.s.
Possibilities provided by Web learning environment	2,5 (0,84)	2,5 (0,82)	0,0 n.s.

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

Students' views on the disadvantages of Web-based learning were represented by nine factors. The nine-factor solution explained 54,3 % of the total variance. The negative aspects of virtual learning dealt with the following matters: "Lack of interaction with other students," "Technical difficulties," "Lack of time," "Expensive cost of studies," "Difficulties with the Web-pages," "Difficulties with communication," "Lack of personal guidance, " "Difficulties with the whole environment," and "Studies were too demanding". The highest loading variables for each factor are presented in Table 5. Composite variables were created based on factor analysis and reliability analysis. Reliability was measured by Cronbach's Alpha, which varied from .91 to .71 showing that all composite variables were reliable to be used for further analysis.

Table 5. Factor solution for the disadvantages of learning in virtual university

Factor	Description of the first three items on the factor	Loading
F1 Lack of interaction with other students (10 items)	I did not like the idea of not knowing my fellow students I felt too distant from my fellow students It was difficult not to see the facial expressions of others	.86 .85 .80
F2 Technical difficulties (8 items)	The pages of Web course did not load at all I had difficulties to access the course pages The connection to the Web-course was often suddenly lost	.79 .72 .71
F3 Lack of time (4 items)	I had problems to find time to study I could not keep my study-plan I had problems in fitting my studies to my life situation	.78 .77 .69
F4 Expensive cost of studies (4 items)	The Web-connection were too expensive. Due to the expenses the time spent in Web was too short. The equipment and materials needed were too expensive	.85 .71 .71
F5 Difficulties with the Web-pages (3 items)	I was not able to save the page I needed I was not able to print materials from the Web-pages I had problems in finding the page I needed	.70 .53 .49
F6 Difficulties with communication (4 items)	I found it difficult to express myself to unknown people I had problems to express myself by writing I found it difficult to participate to the mutual discussion in Web	.76 .64 .46
F7 Lack of personal guidance (3 items)	I did not receive personal feedback about my learning I did not receive enough guidance for planning my studies It was difficult to contact the teacher	.60 .59 .46
F8 Difficulties with the whole environment (3 items)	I could not follow the links in the Web-course The Web environment was difficult to know I could not take advantage of the links in the Web-course	.68 .63 .44
F9 Studies were too demanding (3 items)	The contents of the studies were too demanding I was disturbed by the huge amount of knowledge in Web-course I felt I had too much responsibility for my studies	.72 .64 .48

The means in each factor representing the disadvantages of learning show that the students had not experienced many negative learning experiences with their virtual studies. Most of the means in each factor are lower than 3 in the scale 1-5. ANOVA statistics was used to explore the possible differences of males and females concerning the disadvantages of learning in the virtual university. No statistical significant differences were found in any of the nine factors representing possible difficulties in Web-based learning. However, some differences were found between the students of HEVI and Apaja (see Table 6). The students of HEVI found the expensive cost of studies to be a bigger disadvantage in Web-based learning than the students of Apaja. Furthermore, they complained about the lack of personal guidance and studies that were too demanding for them in greater amount than the students of Apaja (see Table 6).

Table 6. Group HEVI / Apaja: Means, standard deviations (in parentheses) and F-values with significance on disadvantages of learning factors.

Factor	HEVI N= 218	Apaja N = 110	F-value and significance
F1	1,9 (0,84)	1,9 (0,93)	0,0 n.s.
F2	1,6 (0,74)	1,6 (0,66)	0,3 n.s.
F3	2,6 (1,18)	2,3 (1,14)	2,7 n.s.
F4 Expensive cost of studies	2,1 (1,04)	1,4 (0,74)	18,3 ***
F5	1,6 (0,82)	1,5 (0,79)	0,7 n.s.
F6	1,8 (0,77)	1,7 (0,76)	0,5 n.s.
F7 Lack of personal guidance	2,3 (1,03)	2,0 (1,00)	3,0 *
F8	1,8 (0,88)	1,6 (0,87)	1,8 n.s.
F9 Studies were too demanding	1,8 (0,93)	1,5 (0,75)	5,1 ***

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

The educational background of students explained some of the negative experiences they had experienced in the Web-based learning environment. The students with polytechnics and vocational education complained more lack of time than the students with higher education or secondary backgrounds (see Table 7). On the other hand, the students with secondary education had more problems with the expensive cost of Web-courses than the students with other kinds of educational background had. The students with polytechnics and vocational education had more difficulties with communication in Web than the other students had. Furthermore, they felt the studies more demanding than the other groups of students (see Table 7).

Table 7. Group: Education. Mean Scores, standard deviations (in parentheses) and F-values with significance on disadvantages of learning factors.

Factor	Basic and upper secondary	Polytechnics and vocational	Higher education	F-value and significance
F1	1,9 (0,77)	1,9 (0,77)	1,8 (0,96)	0,3 n.s.
F2	1,6 (0,74)	1,7 (0,79)	1,5 (0,67)	0,9 n.s.
F3 Lack of time	2,3 (1,14)	2,8 (1,14)	2,4 (1,18)	3,9 *
F4 Cost	2,2 (1,11)	2,0 (0,99)	1,6 (0,92)	9,2 ***
F5	1,6 (0,84)	1,6 (0,89)	1,5 (0,75)	0,7 n.s.
F6 Communi-cation	1,7 (0,72)	1,9 (0,82)	1,7 (0,78)	4,7 **
F7	2,2 (0,97)	2,4 (1,12)	2,0 (0,99)	1,3 n.s.
F8	1,7 (0,66)	1,8 (0,94)	1,7 (0,91)	1,3 n.s.
F9 Demanding	1,7 (0,81)	2,0 (0,99)	1,5 (0,79)	7,4 ***

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

The age was a natural explanation for many disadvantages experienced by students. The older students had experienced more difficulties with communication than the younger students. Furthermore, they had had more difficulties with the whole environment in general (see Table 8).

Table 8. Group: Age. Mean Scores, standard deviations (in parentheses) and F-values with significance on disadvantages of learning factors.

Factor	Age 35 and under	Age 36 and above	F-value and significance
F1	1,8 (0,85)	1,9 (0,90)	0,2 n.s.
F2	1,6 (0,72)	1,6 (0,73)	0,1 n.s.
F3	2,5 (1,15)	2,5 (1,22)	0,0 n.s.
F4	1,8 (0,93)	1,9 (1,08)	0,0 n.s.
F5	1,5 (0,73)	1,6 (0,89)	2,7 n.s.
F6 Commu-nication	1,6 (0,65)	1,8 (0,89)	5,8 *
F7	2,1 (0,92)	2,3 (1,15)	2,9 n.s.
F8 The whole environ ment	1,6 (0,69)	1,8 (1,00)	4,8 *
F9	1,6 (0,83)	1,8 (0,92)	1,4 n.s.

Scale= 1 = does not describe ... 5 = describes well
Significance: p< .05 = *, p< .01 =**, p< .001 = ***

Concluding remarks

The findings of the study indicate that application of constructivist approaches to Web-based learning has more advantages than disadvantages as evaluated by students of the virtual university. However, different learners have unique needs that should be acknowledged more in planning and implementing Web-courses and Web-based learning environment. As our study shows, the age and the educational background of the student are important factors that influence his/her learning. Furthermore, the findings have significant educational implications. Students' views on learning in

virtual university can be used in the process of building more learner-centered approaches to Web-based teaching. The results of this study give information about the preferences in learning by different learners. The empirical results show some of these preferences that can be acknowledged in developing the virtual university for the future.

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